

Perceived exercise benefits and barriers among power wheelchair soccer players

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Abstract—Lack of exercise is a major risk factor for secondary conditions among persons dependent upon motorized wheelchairs. Power wheelchair soccer is a unique exercise opportunity for this population, and understanding factors that influence exercise decision-making is necessary for clinicians to help those in motorized chairs reduce their secondary risk. Therefore, this study examined differences in perceived benefits and barriers to exercise among power wheelchair soccer players using a mixed-methods analysis. The most common perceived benefit to exercise was “Exercising lets me have contact with friends and persons I enjoy.” Post hoc comparisons of quantitative data indicated that persons with muscular dystrophy perceived exercise to be significantly less important than did other disability groups ($p < 0.05$). “Exercise is hard work for me,” “Exercise tires me,” and “There are too few places for me to exercise” were the most common perceived barriers. These findings can assist with development of exercise opportunities for power wheelchair users.

Key words: disability sport, environmental barriers, multiple sclerosis, physical disability, rehabilitation, social barriers, social cognitive theory, spinal cord injury, therapeutic exercise, traumatic brain injury.

INTRODUCTION

Regular exercise is associated with multiple positive health outcomes among persons with physical disabilities. Specifically, a lifestyle that includes regular exercise has been shown to improve quality of life and reduce risk of secondary conditions associated with disability, such

as obesity, depression, and pain [1]. Persons with physical disabilities are less active than the general population and therefore less likely to gain associated health benefits [2–4]. Mobility is a major exercise issue within this population—many depend upon wheelchairs to engage in sport and recreation (e.g., persons with cerebral palsy [CP] or muscular dystrophy [MD]). Fortunately, wheelchair sport can provide meaningful exercise opportunities. This option is a growing component of rehabilitation and postrehabilitation services for persons with physical disabilities and chronic conditions [5–7].

Wheelchair sport results in important benefits in the cognitive, psychomotor, and affective domains. Di Russo and others have reported that open-skill wheelchair sports enhance executive processing skills needed for everyday function [8]. Psychomotor benefits of wheelchair sport include improved fitness [9–12] and wheelchair mobility [13–14]. These improvements are not surprising, given that energy expenditure in various wheelchair sports is sufficient for health-related benefits and can be as high as five times resting rates [15–17]. Affective outcomes might constitute the most important

Abbreviations: CP = cerebral palsy, EBBS = Exercise Benefits and Barriers Scale, MD = muscular dystrophy.

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benefit, however. In a study of veteran wheelchair games attendees, participants reported that sport enhanced their personal relationships, social interactions, self-care skills, and acceptance of disability [14]. Improved quality of life and affect are important outcomes of any rehabilitation or exercise intervention and have been consistently reported across multiple wheelchair sport settings [9,18–21].

Although wheelchair sport is an option for many persons with physical disabilities, those with the highest levels of functional impairment have fewer disability sport options and therefore are at greater risk for reduced exercise and associated secondary conditions [22–23]. Power wheelchair soccer was the first sport developed for persons requiring electric rather than manual wheelchairs. It is an increasingly popular exercise option for persons with high levels of impairment [22,24]. Although little research has addressed outcomes of power soccer participation, limited empirical data support similar psychomotor and affective benefits as disability sport in general. Barfield and colleagues noted that 71 percent of power wheelchair soccer players with CP or MD sustained an exercise intensity of 55 percent of peak heart rate for more than 30 min during power wheelchair soccer competition [25]. This intensity is associated with health-related fitness improvement. Additionally, Kumar and colleagues noted greater community interaction among power wheelchair users who participated in veteran wheelchair games compared with nonparticipants [22]. To increase the number of persons benefiting, however, researchers must understand factors that encourage or discourage exercise within this population.

RESEARCH PROBLEM

Despite the potential benefits of power wheelchair soccer, factors influencing exercise in this population are undocumented. To encourage exercise, multiple authors have called for examination of perceived exercise influences in homogeneous samples of distinct disability groups [26–28]. Power soccer players are a distinct group with greater barriers to exercise because of greater levels of impairment [23,29]. The primary purpose of this study was to examine the perceived benefits and barriers to exercise among power wheelchair soccer players. Because physical and environmental factors can affect how persons with physical disabilities perceive experiences [30], we examined benefits and barriers within power soccer play-

ers as a whole and across demographic groups when significant quantitative differences were found.

METHODS

Participants

Participants were recruited from a national power wheelchair soccer competition. This recruitment method was chosen to identify a nationally representative, demographically robust cohort. All methods were approved by the Emory and Henry College Institutional Review Board before data collection, and all participants provided informed consent.

Procedures

The power soccer tournament director and individual team coaches were contacted about the study before a national event. Coaches asked athletes whether they were interested in participating. If an individual expressed interest, he or she completed an informed consent form, a brief demographic survey, and the Exercise Benefits and Barriers Scale (EBBS) at the tournament. Score sheets were collected by the tournament director so that researchers could not influence or direct participant responses.

Instrument

The EBBS produces three numeric scores (total, benefits, barriers) and allows for reflection on 43 personal and environmental items, thereby providing researchers with both qualitative and quantitative data (**Figure 1**). Each statement is scored in a 4-item, forced-choice Likert format, in which 1 indicates “strongly disagree” and 4 indicates “strongly agree.” When the instrument is used as a whole, the possible range of scores is 43 to 172, with higher scores indicating a more favorable perception of exercise relative to perceived barriers. The possible range of scores on the benefits scale is 29 to 116, and on the barriers scale is 14 to 56, with higher scores indicating greater perceived benefits or barriers to exercise, respectively. Acceptable reliability and construct validity of the instrument have been reported [31–32].

Analyses

We used a mixed-methods analysis to examine perceptions among power soccer players. To examine qualitative responses, we recorded the three highest-ranked

Factor		Exercise Benefit Statements
Personal	My disposition is improved with exercise.	Exercise improves the way my body looks.
	Exercising improves my self-concept.	Exercise increases my mental alertness.
	I have improved feelings of well-being from exercise.	Exercising helps me sleep better at night.
	Exercising makes me feel relaxed.	Exercise decreases feelings of stress and tension for me.
	I enjoy exercise.	Exercising increases my level of physical fitness.
	Exercise improves overall body functioning for me.	Exercising improves functioning of my cardiovascular system.
	Exercise increases my muscle strength.	Exercise improves my flexibility.
	My physical endurance is improved by exercising.	Exercise helps me decrease fatigue.
	Exercise increases my stamina.	Exercise improves my mental health.
	My muscle tone is improved with exercise.	Exercising will keep me from having high blood pressure.
Environmental	I will prevent heart attacks by exercising.	I will live longer if I exercise.
	Exercise gives me a sense of personal accomplishment.	Exercise allows me to carry out normal activities without becoming tired.
	Exercise is good entertainment for me.	Exercising is a good way for me to meet people.
	Exercise improves the quality of my work.	Exercising increases my acceptance by others.
	Exercising lets me have contact with friends and persons I enjoy.	
		Exercise Barrier Statements
Personal	Exercising takes too much of my time.	I am too embarrassed to exercise.
	Exercise is hard work for me.	Exercise tires me.
	I think people in exercise clothes look funny.	I am fatigued by exercise.
Environmental	Places for me to exercise are too far away.	Exercise facilities do not have convenient schedules for me.
	It costs too much to exercise.	There are too few places for me to exercise.
	My significant other does not encourage exercise.	Exercise takes too much time from family relationships.
	Exercise takes too much time from my family responsibilities.	My family members do not encourage me to exercise.

Figure 1.
Benefit and barrier items on Exercise Benefits and Barriers Scale.

benefits and barriers for the entire cohort. Items were listed in order of influence, and additional items were listed when ties were present. To examine quantitative distinctions, we used Kruskal-Wallis nonparametric tests to compare median EBBS total, EBBS benefit, and EBBS barrier scores by disability type (CP, MD, or other), age (18–29 yr or ≥ 30 yr), sex, power wheelchair soccer experience (≤ 1 yr, 2–4 yr, or ≥ 5 yr), and disability sport experience (≤ 2.5 yr, 3–9 yr, or ≥ 10 yr). When significant differences were detected among group medians ($p < 0.05$), qualitative responses were reexamined within corresponding demographic groups.

RESULTS

We enrolled a total of 25 participants. Their mean age was 28.8 ± 9.2 yr; they were an average 163.7 ± 11.5 cm tall, weighed an average 61.8 ± 17.8 kg, and had an average of 3.2 ± 2.5 yr of power soccer experience. Most participants were male (76%) and Caucasian (76%). Three

participants were college graduates, with another nine (36%) having some college education. The remaining 13 (52%) completed high school but did not attend college. Participants consisted of individuals with CP ($n = 13$), MD ($n = 5$), and other physical disabilities that included multiple sclerosis, spinal cord injury, and traumatic brain injury ($n = 7$).

For the cohort as a whole, participants reported both personal and environmental influences as primary benefits to exercise (**Figure 2**). “Exercising lets me have contact with friends and persons I enjoy” was the most important perceived benefit, and this item was consistent across most demographic groups. Median EBBS total and EBBS benefit scores differed significantly among disability groups (**Table**), specifically because persons with CP and other physical disabilities perceived exercise to be significantly more important than did persons with MD ($p < 0.05$). Median EBBS total and EBBS benefit scores were not significantly different for age, sex, or playing experience. Specific to perceived exercise barriers, “Exercise is hard work for me” and “Exercise tires

Benefit Statement	Factor
Exercising lets me have contact with friends and persons I enjoy.	Environmental
I enjoy exercise.	Personal
Exercise improves my mental health.	Personal
Exercising is a good way for me to meet new people.	Environmental
Exercise is good entertainment for me.	Environmental
Barrier Statement	Factor
Exercise is hard work for me.	Personal
Exercise tires me.	Personal
There are too few places for me to exercise.	Environmental

Figure 2.

Perceived benefits and barriers of entire cohort ($N = 25$). Statements represent top three ranked perceptions (additional items represent ties). *Tied items.

me” were the highest ranked barriers for the entire cohort. Median EBBS barrier scores did not differ significantly among demographic groups, indicating that disability type, age, sex, and playing experience did not affect barrier rankings.

DISCUSSION

Exercise Benefits

Individuals who play power wheelchair soccer perceived the primary benefit to be “Exercising lets me have contact with friends and persons I enjoy.” This outcome is consistent with the literature reporting the positive environmental influence of social support among multiple populations with physical disabilities [33–35] and the general population [32]. Our cohort also reported personal benefit factors such as “I enjoy exercise” and “Exercise improves my mental health.” These perceived benefits are consistent with motivation and attitude factors reported for persons with [26,36] and without [37] physical disabilities.

However, “Exercising improves my self-concept,” the EBBS item most similar to self-efficacy, was not perceived as important by power wheelchair soccer players. Self-efficacy reflects an individual’s perceived competence in a given behavior and is a typical exercise influence for persons with [38] and without [39] physical disabilities. The absence of this influence in the current sample could be due to the dynamics of the active cohort. Sport participants might have high levels of exercise self-efficacy and thus would not perceive the same benefit of exercise in this regard. If this assumption is accurate, sport participants may have already overcome any initial trepidation about trying exercise, and other factors have become more important to their continued exercise participation. This rationale fits with the reports of Cardinal and others indicating that decisional pros, or reasons to exercise, outweigh decisional cons among regular exercisers (e.g., current sport participants) [39]. However, alternative personal benefits (e.g., contact with friends, meeting new people, improving mental health) simply might be most important to power wheelchair users, a group with few opportunities for activity. This possibility seems realistic if one considers that the cohort reported only social and psychological factors, not other benefits typically reported in exercise literature (e.g., physical performance gains, life enhancement).

It is also important to note that perceived benefits varied by disability type. Inconsistent with the primarily attitudinal influences reported for many persons with physical disabilities [26,33,36], power wheelchair soccer players with CP perceived several physical outcome benefits, including improvement of muscle tone and cardiovascular functioning (**Figure 3**). However, persons with MD reported social interaction as the primary benefit of exercise. The importance of social interaction has been noted for multiple disability groups [34,36,40], but the focus on one particular benefit factor is unique to the lit-

Table.

Exercise Benefits and Barriers Scale (EBBS) scores by disability type.

EBBS Score	Cerebral Palsy ($n = 13$)	Muscular Dystrophy ($n = 5$)	Other ($n = 7$)	χ^2	p -Value
Total	140 \pm 13	118 \pm 9	145 \pm 15	8.78	0.01
Benefit	99 \pm 11	79 \pm 7	101 \pm 12	9.43	0.009
Barrier	42 \pm 6	40 \pm 2	44 \pm 5	2.51	0.29

Note: EBBS total scores range from 43 to 172, with higher scores reflecting more favorable perception of exercise relative to perceived barriers. Benefit scores range from 29 to 116 and barrier scores range from 14 to 56, with higher scores reflecting greater benefit or barrier, respectively.

Participants with Cerebral Palsy (n = 13)	Participants with Muscular Dystrophy (n = 5)	Other (n = 7)
Exercising lets me have contact with friends and persons I enjoy.	Exercise is good entertainment for me.	I enjoy exercise.
*My muscle tone is improved with exercise.	Exercising is a good way for me to meet new people.	Exercise improves my mental health.
*I will live longer if I exercise.	Exercising lets me have contact with friends and persons I enjoy.	Exercise decreases feelings of stress and tension for me.
*My physical endurance is improved by exercising.		
*I have improved feelings of well-being from exercise.		
*Exercise improves functioning of my cardiovascular system.		

Figure 3.
Benefit differences by disability group. *Tied items.

erature. Many individuals with MD regress functionally despite involvement in exercise; these participants may have focused primarily on the social benefits of a team sport. In contrast, some participants with CP might have had functional improvement from exercise and wanted to continue improving physical performance through sport. Persons with other physical disabilities reported strictly psychological benefits (**Figure 3**). Again, it is not unusual for persons with physical disabilities to perceive affective benefits from exercise, but it is unique that this group reported this factor to the exclusion of other possible benefits.

Exercise Barriers

Despite the multitude of barriers reported in the literature for people with physical disabilities, the current cohort reported three consistent barriers, namely “Exercise is hard work for me,” “Exercise tires me,” and “There are too few places to exercise.” Given the limited functional capacity of participants, it was not surprising to identify “physical exertion” items as primary barriers to exercise. Physical exertion was first used by Sechrist et al. [31] and is consistent with “lack of energy” barriers reported for multiple populations, including those with [29,36,41–42] and without [32,37] physical disabilities. Limited places to exercise is also consistent with literature for adults and children with physical disabilities [36,43] and young adults without disabilities [32]. Interestingly, for the group as a whole, exercise cost and social support were not identified as primary barriers despite the increased cost and dependence on others required for them to access activity settings. Our cohort might have already overcome these barriers, given that they were already active sport participants. In essence, cost and social support may have been barriers at one point, but the participants seemed to have overcome them and no longer perceived access as a major barrier to regu-

lar exercise. This finding is an important distinction to barriers reported for persons with disabilities in general.

Study Limitations

Two limitations to the current study deserve attention. First, study participants were a small convenience sample rather than a large random sample. To better understand exercise perceptions, researchers should recruit many participants randomly from a national representative sample. However, small numbers of disability sport participants make recruitment, randomization, and analysis difficult [44]. Nonsignificant differences between groups could reflect insufficient power due to the small sample size. We did use nonparametric tests to control for limited statistical power, but sample size should still be considered for specific demographic groups. Second, power wheelchair soccer players are not necessarily representative of all power wheelchair users. The sample was limited to power soccer competitors because of the need to examine benefits and barriers in a specific homogenous group. Because persons with physical disabilities want to incorporate exercise into their lifestyle [42,45–46], we felt it was important to examine participants who had had exposure to exercise and who could address both benefits and barriers. The stage of exercise change can affect perception, and our cohort likely represents a higher percentage of regular exercisers than most power wheelchair users.

CONCLUSIONS

In a group of power wheelchair soccer players, perceived benefits of exercise are influenced by disability type. Participants did report one environmental influence, the ability to have contact with friends, but most perceived benefits were primarily personal rather than environmental.

Physical exertion and access to facilities were the primary barriers to exercise, and this finding is consistent in higher-functioning groups with physical disabilities.

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Author Contributions:

Study concept and design: J. P. Barfield, L. A. Malone.

Acquisition of data: J. P. Barfield.

Analysis and interpretation of data: J. P. Barfield, L. A. Malone.

Drafting of manuscript: J. P. Barfield, L. A. Malone.

Critical revision of manuscript for important intellectual content: J. P. Barfield, L. A. Malone.

Statistical analysis: J. P. Barfield, L. A. Malone.

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Participant Follow-Up: The authors will notify coaches and program supervisors of participants when the research is published. The authors did not collect personal contact information from participants but will be able to notify individuals indirectly through coaches and supervisors.

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